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water. These were the proportions actually employed by Pfeffer and given by Ostwald and others. As compared with the conventional composition of a 1% solution they involve a deficiency of one ninety-ninth part of the sugar, which is far within the limits of error in these investigations; nor ought they to mislead any body, as the proportions of this kind of percenticity are explained in the text-books and were given in my paper.

The departure from the conventional proportions of a one-per-cent. solution are not from error nor arbitrary, as the method of comparing the osmotic pressure of different solutions relatively to the gram-molecules of the substances dissolved involves the employment of a uniform quantity of the solvent.

G. MACLOSKIE.

PRINCETON UNIVERSITY, March 25, 1899.

NOTES ON PHYSICS.

WIRELESS TELEGRAPHY.

AT a recent meeting of the Institution of Electrical Engineers, Marconi described his recent work along the lines of wireless telegraphy. In transmitting he uses a 10-inch spark coil and a battery giving about 14 volts and 6 to 8 amperes. For his spark circuit he uses two arrangements, depending upon whether it is necessary to confine the sending of the signals to one direction or not. In the former case cylindrical reflectors are used and capacity is obtained by strips of sheet metal attached to the two spark balls. In the latter case there are no reflectors and one ball is grounded while the other is connected to a vertical wire. A Morse key in the primary circuit makes the signals. The length of the vertical wire depends upon the distance to be covered. A wire 20 feet high will transmit one mile; 40 feet, 4 miles; 80 feet, 10 miles approximately; the distance seems to increase about as the square of the height of the wire. The receiver consists of a coherer, or sensitive tube, about four centimeters long, fitted with metallic pole-pieces and partly filled with nickel and silver filings. When not under the action of the radiation the resistance of this tube is practically infinite, but is reduced by the cohering of the filings

under the action of radiation to from 100 to 500 ohms. This allows a current to flow from a local battery through a relay circuit in which is a vibrating tapper and a sounder, or writer. The former, tapping the coherer, restores the high resistance by separating the filings. The receiver is also supplied, either with the metal strips and reflector or with the ground connection and vertical wire, according as the former or the latter is used in the transmission.

When the reflectors are used the ray within which the signals can be received may be made very narrow; in one case at a distance of $1\frac{1}{2}$ miles it was only about 100 feet. Marconi found that horizontal wires were useless, and accounted for this by the theory that the waves from the vertical wire had a vertical plane of polarization and were, therefore, not absorbed by the surface of the earth.

A number of installations have worked successfully and without difficulty for prolonged intervals and in all sorts of weather. In one case an 18-mile transmission was carried on with an average of about one thousand words per day. With the vertical wire transmitter, hills seem to make little difference with the transmission. In one case a distance of five miles over land, with several intervening hills, was successfully covered.

F. C. C.

BOTANICAL NOTES.

AN ELEMENTARY BOOK ON LICHENS.

IT is a hopeful sign when we find amply qualified men engaging in the work of writing elementary text-books for the use of students in the schools. It has been the duty of the writer on more occasions than he has wished to severely criticise books written for beginners by those who themselves had but little knowledge of the matter treated. It has been at once the scandal and the weakness of the elementary science text-books that they have too often contained very little Science, for the very good reason that their compilers were unacquainted with Science. Some time ago Dr. Albert Schneider published a large treatise on the lichens, which at once proved his profound knowledge of the subject as well as his ability to communicate it clearly and forcibly. It is not necessary that

we should agree with the views as to the nature of lichens held by Dr. Schneider in order to enable us to appreciate the value of the service which he has rendered to the cause of Lichenology in bringing out first his large 'Text-Book' and next his 'Guide.' The latter is intended for the use of beginners and amateurs, and since it is the only book which is adapted to their use it is of especial interest. It is now possible for a student to take up the study of these curious and very difficult plants with a reasonable hope of success. The Boston publisher, Whidden, has brought it out in an attractive form.

A TEXAS SCHOOL OF BOTANY.

THE welcome announcement is made that a School of Botany has been established in the University of Texas, to become operative with the next University year. It will be under the directorship of Professor Doctor William L. Bray, of the chair of botany. The University of Texas has been noted for its progressive spirit, and this is but another illustration of the wise policy of its administrators. We learn that, in addition to the usual University instruction in morphology, physiology, ecology, etc., especial attention will be given to the botanical survey of the State. To this end the School of Botany proposes to cooperate with local botanists, secondary affiliated schools, scientific societies, etc., in all quarters of the State. Under the direction and leadership of an energetic and enthusiastic body of workers in the University, the botanists of Texas may well hope to accomplish much. The State of Texas is to be congratulated upon this forward step.

FALSE 'AIDS' IN BOTANY.

THIS is the time of the year when the country is flooded with circulars describing all sorts of 'aids' for use in teaching or studying botany. It must be that these worthless things are bought by ignorant teachers or school boards, for otherwise they would not be advertised so freely. We have before us one of the old-style 'Plant Analysis' sheets, published by E. R. Good, of Tiffin, Ohio, which proves that in some portions of our country the botanical world is supposed to have remained absolutely at rest for the past twenty-five or thirty years. As a

leaf from quite ancient history in botany one of these sheets is interesting, but as an aid in modern botany it is simply ridiculous.

From J. M. Olcott, of Chicago, we have another reminder of the past in the form of a perforated sheet of paper called 'A System of Plant Study,' which we are told is a sample of the sheets which make up a book 'containing space for mounting and fully describing fifty-one botanical specimens,' and in addition 'full directions for collecting, pressing, mounting, photographing, analyzing and preserving plant forms and specimens.' Of course, no botanist will have anything to do with such trash, but for the non-botanical it may be well to say that this is *not* the way that botanists make herbaria and describe plants. The pupil who is so unfortunate as to use such an 'aid' will have to unlearn practically everything he learns from it.

By all odds the worst thing which has come to our attention recently is the 'Teacher's Botanical Aid,' sent out by the Western Publishing House of Chicago, and consisting of twenty-eight charts, about two feet by three, on which are rough copies of many of the illustrations found in the older text-books of botany. The copying has been done by careless or incompetent hands, so that, in spite of the author's statement that they 'will prove a direct aid in teaching drawing,' we are compelled to say that they are not only inaccurate botanically, but quite shocking from the artistic standpoint. The author intends these charts to be used in Nature Study, so that we are to have our children's time taken up by 'reciting' from these drawings under the impression that they are studying Nature. The teachers of Nature Study who know Nature, and 'who have depended for years upon their own resources' (to quote the author's words), will not think of putting these charts between the pupil and Nature, but we fear that the unprepared and uninformed may be induced to use them. If the charts were accurately drawn they would be of doubtful value in Nature Study, but with all their glaring inaccuracies they are worse than useless.

MINNESOTA BOTANICAL STUDIES.

No other State in the Union can boast of such high class work in botany as that which is pub-

lished in the Minnesota Botanical Studies as a part of the publications of the State Geological and Natural History Survey. Appearing at intervals in the form of a periodical, the 'Studies' are unique among the botanical publications of the country. Here is a case of the endowment of research which is to be commended to other States. Eight titles appear in the current number (Part II., Second Series) including 'Seedlings of certain woody plants, Comparative anatomy of hypocotyl and epicotyl in woody plants, Seed dissemination and distribution of *Razoumofskyia robusta*, Observations on Constantinea,' etc., etc.

CHARLES E. BESSEY.

THE UNIVERSITY OF NEBRASKA.

THE BRAIN OF HERMANN VON HELMHOLTZ.

PROFESSOR DAVID HANSEMAN, of the University of Berlin, has contributed to the *Zeitschrift für Psychologie* (Part I. of Volume XX., issued on March 7th) an account of his examination of the brain of the late Professor von Helmholtz. Death was due to apoplexy and occurred on September 8, 1894, when Helmholtz was 73 years of age. The circumference of the head outside the scalp was 59 cm. and of the skull 55 cm. The width of the skull was 15.5 cm. and its length 18.3 cm. The cephalic index was consequently 85.25, which represents a broad head. The size of the head was about the same as that of Bismarck and slightly smaller than that of Wagner, both of whom had large heads. Darwin's head, on the other hand, was only 56.3 cm. in circumference. The weight of the brain with the coagulated blood was 1700 g. and without the blood about 1440 g., which is nearly 100 g. heavier than the average. It is, however, now generally recognized that the weight of the brain alone is not an index of mental capacity. The convolutions are more important, and here the examination of von Helmholtz's brain showed that the sulci were peculiarly deep and well marked, this being especially the case in those parts of the brain which the researches of Flechsig have shown to be concerned with associations. The frontal convolutions are so deeply cut by numerous sulci that it is difficult

to follow the recognized fissures. The article contains two photographs of the brain taken from plaster casts. The brain itself has not been preserved.

We are informed, both on the authority of von Helmholtz himself and as the result of the post-mortem examination, that he had been in youth somewhat hydrocephalous, which was also the case with Cuvier, who had one of the heaviest (1830 g.) brains known. It has been maintained by Perls, and more guardedly by Edinger, that hydrocephaly in youth is an advantage in enlarging the skull and giving the brain space for growth. Hansemann thinks that the pressure on the brain resulting from slight hydrocephaly is an adequate anatomical explanation of unusual intelligence. He refrains, however, from recommending the making of geniuses by injecting fluid into the skulls of babies.

SCIENTIFIC NOTES AND NEWS.

A MEETING of the Council of the American Association for the Advancement of Science has been called by the President, Professor F. W. Putnam, and the Permanent Secretary, Dr. L. O. Howard, on Tuesday, April 18th; at 4:30 p. m., at the Cosmos Club, Washington, D. C.

THE New York Academy of Sciences will hold its annual exhibition and reception on Wednesday and Thursday, April 19th and 20th. As has been the case in other years, the first evening will be reserved for members of the Academy and specially invited guests, while a large number of those interested in science will be invited to be present on the second evening. On Thursday afternoon students of the universities and schools will be invited to attend. Tickets for Thursday afternoon or evening can probably be obtained from Professor William Hallack, Columbia University, Chairman of the Committee of Arrangements.

THE Committee of Organization of the International Geological Congress, which meets at Paris from the 16th to the 28th of August, 1900, is as follows: President, M. Albert Gaudry, professor in the Museum of Natural History; Vice-Presidents, M.M. Michel Lévy and Margel Bertrand; General Secretary, M. Charles Barrois.

DR. G. W. HILL has declined to accept the